

SCOPOLAMINE-MORPHINE ANÆSTHESIA.

REPORT ON ITS USE IN SEVENTY-TWO CASES.

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IN May, 1900, Schneiderlin¹ first published his experience with a new method of general anæsthesia produced by the aid of a combination of scopolamine and morphine. Since then a number of reports have been published in Germany and Austria, but I am not aware that anybody has used the method to any extent in this country, or has given a report on it in the literature. As the method undoubtedly has great advantages, it will probably come into more extended use, and some words concerning my experience with it might prove of value to others who may wish to test it.

Scopolamine is an alkaloid extracted from the roots of *scopolamina carniolica*. It is closely related to hyoscyne. According to some authors, hyoscyne and scopolamine are identical, or at least isomeric; while others state that hyoscyne always contains scopolamine and is not a pure alkaloid.

However that may be, it is pretty certain that scopolamine, though it is produced and sold in crystals, is unstable and not absolutely uniform in its composition.

Kochmann² states the following effects of scopolamine, which interest us here.

1. Small doses increase the blood-pressure in consequence of irritation of the vasomotor centre; large doses decrease blood-pressure considerably, damaging the excitomotor apparatus of the heart.

2. The pulse is not changed by small doses; after large doses, in consequence of irritation of the vagus, the pulse becomes less frequent and its elevations become greater.

3. The excitability of the cortex of the brain by faradic currents can be decreased by scopolamine.

4. Hyoscine and scopolamine produce in man sleep, even in small doses. The sleep is preceded by restlessness. Analgesia during the sleep does not exist.

5. Respiration is not damaged by therapeutic doses. Large doses damage it.

6. Secretion of saliva, perspiration, and mucus are stopped by scopolamine.

7. Applied locally, and after absorption, scopolamine is a mydriatic and paralyzes accommodation.

8. Scopolamine is excreted through the kidneys.

9. The fatal dose of scopolamine is unknown. Injection of 0.09 scopolamine intravenously did not produce death in a dog.

Schneiderlin, like other alienists, had used scopolamine in his work in an insane asylum for the production of sleep in restless patients, and had then combined it with morphine in order to produce surgical anæsthesia for operations necessary on his demented patients. He expected to counteract the evil effects of morphine, particularly with regard to blood-pressure and pulse, by combining scopolamine with morphine, and his theoretical construction proved successful in his practice.

The greatest difficulty has since been found in determining the best proportion of the two drugs. If too much morphine is given, the effect on the heart becomes dangerous. If too much scopolamine is given, a state of excitement is produced similar to that following atropine poisoning. The patients become restless. It is difficult to keep them quiet. They talk as if in a delirium. The pupils are widely dilated and rigid, and the face is flushed. The patients demand water constantly and complain of dryness, but the excitement soon wears off, and neither in man nor in dogs have any cases become known where scopolamine alone has produced death. I have experimented on a dog of some eight pounds, to whom I gave fifteen times the dose we use on human beings, and, if I figure pound for pound, 225 times the dose we use on human adults of average weight, and it did not affect the dog's health at all.

In dosage and proportion, I have followed Korff,³ who

published his experience with 200 cases. He gives one-tenth milligramme scopolamine and 25 milligrammes of morphine. This amount is divided in three doses, which are injected two and a half, one and a half, and one-half hour before the operation. He states that these doses are without danger, but that their effect varies in different individuals. The injection is given hypodermically in any part of the body. He thinks that if this dose does not suffice, larger doses ought not to be given, but chloroform or ether should then be used.

It is seen, therefore, that scopolamine-morphine is used for two purposes: first, with the intention to perform the whole operation under this anæsthesia alone; secondly, as a preliminary to anæsthesia by inhalation of chloroform or ether.

If the case is a complete success, the patient becomes sleepy after the first injection, is fast asleep after the second, and unconscious and insensible to pain after the third. Most of the patients do not even feel the third injection. The operation may then begin one-half hour after the last injection, and can proceed for hours without any other anæsthetic. The patients lie on the table with eyes closed or open, and do not move or react in any way. The pulse is often rapid, up to 120; sometimes very slow, down to 40. Respiration is quiet, and there is none of that disagreeable and dangerous accumulation of mucus in the mouth. The pupil is rigid, either dilated or contracted. The muscles are relaxed. The blood which escapes during the operation is of natural color. After the operation is finished, the patient is returned to the bed still unconscious, and continues to sleep for about five hours after the last injection. There is no retching or vomiting, and when the patient wakes up, food can be given immediately. For about one day the patient has a sensation of dryness in his mouth. There is no interference with the union of the wound or the peristaltic action of the bowels. The patient remembers nothing of the operation, goes to sleep in his bed, and wakes up usually unconscious of the fact that he has been operated on, and incredulous when he is informed that it is all over.

Thus the ideal course of a scopolamine-morphine anaesthesia. If they were all like that there would be no further need of discussions. But this ideal course partakes of the nature of all ideals in that it is frequently unattainable.

It is true that all patients whom I have seen go to sleep after the injection; but that sleep may be such a light one that they wake up when spoken to or moved, so that no manipulation is possible without rousing the patient. Some patients, even if aroused, cannot answer intelligently, but mumble a few unconnected words. Others wake up sufficiently to give correct answers. Others again, though they cannot be roused, move when being handled, or even complain.

Then it becomes necessary to add some other anaesthetic to the scopolamine-morphine. Ether and chloroform have been used by the European operators, and I have added infiltration anaesthesia with 0.6 per cent. salt solution without cocaine, which I have used in a number of cases successfully to the complete exclusion of chloroform. When chloroform is administered, very small quantities have to be used, and in many cases after the first few drops have been given, for the first incision, no more chloroform need be used, so that operations lasting fifteen or thirty minutes can be finished with less than a teaspoonful of chloroform. When the patients are not completely anaesthetized by the scopolamine-morphine, the same observation can be made as when operating without any or only with infiltration anaesthesia. Some organs are sensitive; some are not; some more so than others. The relaxation of the muscles may be more or less complete. While Korff³ reports that he could reduce a dislocation of the shoulder with scopolamine-morphine alone, others emphasize, and that is my experience also, that scopolamine-morphine does not, as a rule, produce complete relaxation of the muscles, so that, for instance, in certain abdominal sections, where the recti muscles have to be held apart, it is necessary to add chloroform to the scopolamine-morphine.

It is noteworthy that even when chloroform has to be added to scopolamine-morphine, the latter still proves of great

value. First, there is no or hardly any excitement. Secondly, very little chloroform is needed, as stated above. Thirdly, the vomiting is very much reduced or entirely absent. Fourthly, the patients sleep for hours after the operation, and get over the disagreeable postoperative stage without any disturbance. Complete amnesia of everything connected with the operation, from the time the second dose of scopolamine-morphine has been given, is generally observed, so that even patients who appear wide awake, or who resist now and then during the operation, do not remember anything about it, or even refuse positively to believe that the operation is finished.

Scopolamine-morphine has been used in a wide range of operations. I have used it myself so far on seventy-two patients in ninety-two operations. The following is a list of the operations performed. The number of operations is greater than that of the patients, because in a number of cases several operations were performed at the same time, for instance, appendectomy and femoral hernia, cholecystostomy and nephropexy, plastic operation on the vagina, curettement and ovariectomy, etc.:

Amputation of breast, 1; amputation of thigh, 1; appendectomy, 12; appendiceal abscess, 2; cholecystostomy, 1; colostomy, 1; curettement, 8; cystoscopy, 3; extirpation of carcinoma recti, 1; extirpation of carcinoma uteri, 1; extirpation of goitre, 3; extirpation of testicle, 1; extirpation of tubercular glands, 2; extirpation of tumor of chest wall, 1; extirpation of urethral caruncle, 1; operation for stenosis of cervix, 1; hæmorrhoids, 6; abdominal hysterectomy, 5; vaginal hysterectomy, 3; laparotomy for pus-tubes, 2; nephropexy, 1; nephrotomy, 1; plastic operations on vagina, 14; prostatectomy, 1; radical operation for ventral hernia, 2; for inguinal hernia, 10; for femoral hernia, 1; vaginal celiotomy, 3; vaginal ovariectomy, 1; varicose veins of leg, 1; ventrofixation, 1; total, 92.

Of these seventy-two cases, three have died. A carcinoma of the uterus died from hæmorrhage due to laceration of the iliac vein in dissecting off adherent enlarged lymphatic glands.

The case of carcinoma of the rectum, in which the affected portion of the rectum was torn into during the operation, died of peritonitis five days after the operation. The case of prostatectomy, a very bad case of an old man in a septic condition, who was very anæmic in consequence of repeated severe vesical hæmorrhages and who had the largest prostate I have ever seen (much larger than a fist), died some six hours after the operation. In none of these cases can I accuse the scopolamine-morphine.

In the literature on scopolamine-morphine, a number of deaths have been reported as due to the scopolamine-morphine; but it seems to me with very little justification. The only case that seems to be due possibly to the scopolamine-morphine is one reported by Flatau,⁴ in which, after an easy and uneventful operation on a submucous fibroid, the patient, who was exsanguinated by previous hæmorrhages, succumbed six hours afterwards. Her pulse grew weaker and weaker, became intermittent, Cheyne-Stokes respiration was observed. Post-mortem was not performed.

In all the other cases that have been reported, it seems to me entirely unjustified to accuse the scopolamine-morphine.

A number of these fatal cases may have been due to the large doses of morphine which Bloss⁶ had recommended, but which I have never used. Favorable reports are given by Volkmann⁷ on 20 cases; Bonheim⁸ on 70 cases; Wiesinger⁹ on 200 cases; Hartog¹⁰ on 143 cases; Grevsen¹¹ on 69 cases; Semmon¹² on 52 cases, a total of 554 cases.

In only two cases have I given a dose of morphine larger than above indicated. In one case a patient on whom I had operated for a large goitre with scopolamine-morphine was operated on a week later for a large ventral hernia. While the first time she had slept through the whole operation, she was not completely asleep before the second operation, and I gave her an additional 0.015 morphine. The operation was then completed without any chloroform. It lasted sixty-five minutes, and towards the end the patient was sufficiently awake to talk with her friends, and did not interfere with the operation in any way. In another case, in a very big woman with endo-

metritis and descensus of the vagina, the patient also was not completely asleep before the operation, and I gave her an additional 0.015 morphine. But the patient, though asleep during the operation, moved her legs repeatedly, so that we added 9 cubic centimetres of chloroform for the operation, which lasted thirty minutes. In both cases the pupil, before the extra amount of morphine had been given, was dilated, showing a preponderance of the scopolamine, and I therefore risked the additional amount of morphine.

The effect of hyoscine is so much like that of scopolamine, that my first cases on which I operated with hyoscine before I obtained the scopolamine, have had exactly the same course as those operated on with scopolamine. And excision of a urethral caruncle, a vaginal hysterectomy, a radical operation for inguinal hernia were performed without a drop of chloroform, and such operations as appendectomy, ventrofixation, and excision of hæmorrhoids on one patient, radical operation for unilateral or bilateral inguinal hernia on a second and third, appendectomy on a fourth, vaginal radical operation for double pyosalpinx on a fifth, vaginal plastic on a sixth patient were performed with such small quantities of chloroform as 9, 15, 5, 5, 25, 6 cubic centimetres of chloroform respectively.

It has repeatedly been noticed that hysterical patients or patients very much afraid of the operations would respond less completely to the scopolamine-morphine as well as hyoscine morphine. Bloss,⁹ in fact, goes so far as to say that hysterical patients usually become excited under the scopolamine-morphine. This, however, has not been the general rule in my cases.

The amount of chloroform necessary depends not only on the patient, and his reaction to the scopolamine-morphine, but, and not the least, on the anæsthetizer. Our interne, Dr. Fulton, who has watched the anæsthetic in the cases reported here, has become so expert in the use of chloroform that a very few drops of chloroform, 1 to 5 cubic centimetres, suffice now where at first 15 to 25 cubic centimetres would be necessary. The educational value of scopolamine-morphine in teaching econ-

omy in anæsthetics is, I think, not the least important point in its favor.

Scopolamine, when dissolved in water, does not keep long, and it has been our rule to have a new solution made every week. It has repeatedly been noticed that the effect of the scopolamine would decrease towards the end of the week. In the future, we shall have a new solution made every three days. We have always injected the scopolamine and morphine mixed together. I do not know as yet whether the effect of scopolamine-morphine injected separately, even if at the same time, will be different. Experiments in this direction are now under way.

LITERATURE.

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- ¹² Semon. *Ibid.*, p. 1231.